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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/654,203	09/03/2003	James A. Rakowski	RI-/2000	5809
7590 10/29/2010				
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EXAMINER				
ROE, JESSEE RANDALL				
ART UNIT		PAPER NUMBER		
1733				
MAIL DATE		DELIVERY MODE		
10/20/2010		PAPER		

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/654,203  
Filing Date: September 03, 2003  
Appellant(s): RAKOWSKI, JAMES A.

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Robert J. Toth  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the Appeal Brief filed 26 August 2010 and the Supplemental Appeal Brief filed 29 September 2010 appealing from the Office action mailed 23 November 2009.

**(1) Real Party in Interest**

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The following is a list of claims that are rejected and pending in the application:

Claims 1-6, 9-11, 13-14, 16, 18, 20-28 and 99-101 are pending wherein claims 6, 14, 23, 24, 27 and 28 are withdrawn from consideration.

Claims 11, 13, 16, 18, 20-22, 25, and 26 are rejected under 35 U.S.C. §112, first paragraph, as not complying with the written description requirement.

Claims 99-101 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite.

Claims 1-5, 9-11, 13, 16, 18, 20-22 and 26 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,097,311 to Ishibashi et al.

Claims 1-5, 9-11, 13, 16, 18, 20-22, 25-26 and 99-101 are rejected under 35 U.S.C. §103(a) as being unpatentable over Szummer et al., "Hydrogen surface effects in ferritic stainless steels", *J. Alloys and Compounds*, 293-295 (1999), pp. 356-360 in view of JP 10-280103 to Ono et al.

Claims 1-5, 9-11, 13, 18, 21, 25-26, 99 and 101 are rejected under 35 U.S.C. §103(a) as being unpatentable over Szummer et al., "Hydrogen surface effects in ferritic stainless steels", *J. Alloys and Compounds*, 293-295 (1999), pp. 356-360 in view of WO 99/10554 to Linden et al.

Claims 1-5, 9-11, 13, 18, 21, 25-26, 99 and 101 are rejected under 35 U.S.C. §103(a) as being unpatentable over Szummer et al., "Hydrogen surface effects in ferritic stainless steels", *J. Alloys and Compounds*, 293-295 (1999), pp. 356-360 in view of JP 06-172933 to Uematsu et al.

Claims 1-5, 9-11, 13, 16, 18, 20-22, 25-26, 99 and 101 are rejected under 35 U.S.C. §103(a) as being unpatentable over Szummer et al., "Hydrogen surface effects in ferritic stainless steels", *J. Alloys and Compounds*, 293-295 (1999), pp. 356-360 in view of JP 09-209092 to Matsui et al.

#### **(4) Status of Amendments After Final**

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

**(5) Summary of Claimed Subject Matter**

The examiner has no comment on the summary of claimed subject matter contained in the brief.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

**(7) Claims Appendix**

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

**(8) Evidence Relied Upon**

Szummer et al., "Hydrogen surface effects in ferritic stainless steels", *J. Alloys and Compounds*, 293-295 (1999), pp. 356-360.

4,097,311	Ishibashi	06-1978
JP 10-280103	Ono	10-1998
WO 99/10554	Linden et al.	03-1999
JP 06-172933	Uematsu et al.	06-1994
JP 09-209092	Matsui et al.	09-1997

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

Claims 11, 13, 16, 18, 20-22, 25-26 and 101 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In regards to claim 11, the specification does not contain support for the ferritic stainless steel being "uncoated" as claimed.

Claims 99-101 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellant regards as the invention.

With respect to the recitation "aluminum-rich the oxide scale comprising iron and chromium and having a hematite structure,  $a_0$  in the range of 4.95 to 5.04 Å, and  $c_0$  in the range of 13.58 to 13.75 Å" in claim 99, it is unclear if aluminum is included in the oxide scale or if aluminum is lacking from the oxide scale.

Claims 1-5, 9-11, 13, 16, 18, 20-22, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishibashi (US 4,097,311).

In regards to claims 1 and 10-11 Ishibashi ('311) discloses electrolytically polishing (electropolishing) ferritic stainless steel articles (which would include uncoated (exposed, as in amended claims 1, 10, 11, 13 and 26) ferritic stainless steel articles) used for a solar collector (col. 3, lines 28-53 and col. 7, lines 34-50). Ishibashi ('311) further discloses that the stainless steel composition would include 11 to 30 weight percent chromium (col. 3, lines 28-34) and 0.001 to 5 weight percent of at least one element selected from the group of nitrogen, copper, aluminum vanadium, yttrium, titanium, niobium, tantalum, uranium, tungsten, zirconium and hafnium (col. 4, lines 15-22), which encompasses the newly amended claimed range of 0.2 to 1.0 weight percent aluminum. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the claimed amounts of chromium, aluminum, and yttrium from the amounts disclosed by Ishibashi ('311) because Ishibashi ('311) discloses the same utility throughout the disclosed ranges.

With respect to the recitations "so that, when subjected to an oxidizing atmosphere at high temperature, the electropolished surface develops an electrically

conductive, aluminum-rich, oxidation resistant oxide scale comprising chromium and iron and having a hematite structure differing from  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$  as recited in lines 9-13 of claim 1, "wherein lattice parameters differ from  $a_o$  and  $c_o$  of  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ " as recited in claim 2, and "wherein the oxide scale is characterized by lattice parameters  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å" of claim 5, Ishibashi ('311) discloses an  $(\text{FeCr})_2\text{O}_3$  oxide (col. 5, lines 14-19). Additionally, Ishibashi ('311) discloses processing substantially the same composition by the same process (electropolishing). Therefore, the claimed structure and lattice parameters would be expected. MPEP 2112.01 I.

With respect to the amended recitations "wherein the at least one exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere at a temperature in the range of 750°C to 850°C." of claim 3, "wherein the at least one exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C." of claim 4 and "wherein the exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C, and wherein the oxide scale is characterized by  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å" of claim 9, the Examiner notes that these recitations would not be an active step in the process as claimed and are therefore considered a property that would result from the electropolishing of a ferritic stainless steel. MPEP 2112.01 I.



With respect to the amended recitation "so that the exposed electropolished surface develops an aluminum-rich oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C, the oxide scale comprising iron and chromium and having a hematite structure,  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å" of lines 9-13 of claim 10, the Examiner notes that this recitation would not be an active step in the process as claimed and is therefore considered a property that would be the result from the electropolishing of a ferritic stainless steel. MPEP 2112.01 I.

With respect to the amended recitation "wherein the at least one exposed electropolished surface develops an aluminum-rich oxide scale comprising iron and chromium and having a hematite structure  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å, when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C." of claim 13, the Examiner notes that this recitation would not be an active step in the process as claimed and is therefore considered a property that would be the result from the electropolishing of a ferritic stainless steel. MPEP 2112.01 I.

In regards to claims 16 and 18, Ishibashi ('311) further discloses that the stainless steel composition would include 0.001 to 5 weight percent of at least one element selected from the group of nitrogen, copper, aluminum, vanadium, yttrium, titanium, niobium, tantalum, uranium, tungsten, zirconium and hafnium (col. 4, lines 15-22), which would include the amended range of "0.4 up to 0.8 weight percent aluminum". .

In regards to claims 20-22, Ishibashi ('311) discloses that the stainless steel composition would include 11 to 30 weight percent chromium (col. 3, lines 28-34) and 0.001 to 5 weight percent of at least one element selected from the group of nitrogen, copper, aluminum vanadium, yttrium, titanium, niobium, tantalum, uranium, tungsten, zirconium and hafnium (col. 4, lines 15-22).

With respect to the recitation "wherein electropolishing the at least one exposed surface improves resistance of the at least one surface to oxidation when subjected to a temperature and an atmosphere characteristic of operating conditions within a solid oxide fuel cell" of claim 26, the Examiner notes Ishibashi ('311) discloses the same or a substantially similar composition and the same processing. Therefore, this property would be expected. MPEP 2112.01 I.

Claims 1-5, 9-11, 13, 16, 18, 20-22, 25-26, 99-101 are rejected under 35 U.S.C. 103(a) as being unpatentable over Szummer et al. (Hydrogen surface effects in ferritic stainless steels) in view of Ono (JP 10-280103).

In regards to claims 1 and 10-11, Szummer et al. discloses a method for preparing ferritic stainless steels (which would include uncoated and exposed stainless steel) containing 16 weight percent, 17 weight percent and 19.3 weight percent chromium comprising electropolishing the stainless steel (page 356, column 2).

Szummer et al. discloses a method of preparing ferritic stainless steels as described above, but Szummer et al. does not specify that the ferritic stainless steels would comprise at least 0.2 weight percent aluminum and a total weight of rare earth

metals from 0.02 to 1.0 weight percent.

Ono (JP '103) discloses, in the same field of endeavor, adding 0 to 1 weight percent aluminum and 0 to 0.2 weight percent rare earth metals to a ferritic stainless steel alloy, having the same amount of chromium as Szummer et al., to improve oxidation (corrosion) resistance [0017] and [0019].

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added 0 to 1 weight percent aluminum and 0 to 0.2 weight percent rare earth metals, as disclosed by Ono (JP '103), to the ferritic stainless steel, as disclosed by Szummer et al., in order to improve oxidation (corrosion) resistance, as disclosed by Ono (JP '103).

With respect to the amended recitations "so that, when subjected to an oxidizing atmosphere at high temperature, the exposed electropolished surface develops an electrically conductive, aluminum-rich, oxidation resistant oxide scale comprising chromium and iron and having a hematite structure differing from  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ " as recited in lines 9-13 of claim 1, "wherein lattice parameters differ from  $a_o$  and  $c_o$  of  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ " as recited in claim 2, and "wherein the oxide scale is characterized by lattice parameters  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å" of claim 5, neither Szummer et al. nor Ono (JP '103) specify the hematite structure that would be formed. However, Szummer et al. in view of Ono (JP '103) does disclose the same or substantially the same composition in addition to the same process (electropolishing). Therefore, it would be

expected that Szummer et al. in view of Ono (JP '103) would have the hematite structure and the hematite lattice parameters as claimed in the instant invention. MPEP 2112.01 I.

With respect to the recitations "wherein the at least one exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere at a temperature in the range of 750°C to 850°C." of claim 3, "wherein the at least one exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C." of claim 4 and "wherein the exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C, and wherein the oxide scale is characterized by a<sub>o</sub> in the range of 4.95 to 5.04 Å and c<sub>o</sub> in the range of 13.58 to 13.75 Å" of claim 9, the Examiner notes that these recitations would not be an active step in the process as claimed and are therefore considered a property that would result from the electropolishing of a ferritic stainless steel. MPEP 2112.01 I.

With respect to the amended recitation "so that the exposed electropolished surface develops an aluminum-rich oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C, the oxide scale comprising iron and chromium and having a hematite structure, a<sub>o</sub> in the range of 4.95 to 5.04 Å and c<sub>o</sub> in the range of 13.58 to 13.75 Å" of lines 9-13 of claim 10, the Examiner notes that this recitation would not be an active step in the process as claimed and is therefore considered a property that would be the result from the

electropolishing of a ferritic stainless steel. MPEP 2112.01 I.

With respect to the amended recitation "wherein the at least one exposed electropolished surface develops an aluminum-rich oxide scale comprising iron and chromium and having a hematite structure  $a_0$  in the range of 4.95 to 5.04 Å and  $c_0$  in the range of 13.58 to 13.75 Å, when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C." of claim 13, the Examiner notes that this recitation would not be an active step in the process as claimed and is therefore considered a property that would be the result from the electropolishing of a ferritic stainless steel. MPEP 2112.01 I.

In regards to claim 16, Ono (JP '103) discloses adding 0 to 1 weight percent aluminum [0019], which encompasses the newly amended range of 0.4 up to 0.8 weight percent aluminum.

In regards to claim 18, Ono (JP '103) discloses yttrium and hafnium [0017].

In regards to claim 20, Szummer et al. discloses a method for preparing ferritic stainless steels containing 16 weight percent, 17 weight percent and 19.3 weight percent chromium (page 356, column 2). Ono (JP '103) discloses 15 to 30 weight percent chromium, 0 to 1 weight percent aluminum and 0 to 0.2 weight percent rare earth metals ([0013], [0017] and [0019]).

In regards to claim 21, Ono (JP '103) discloses 0 to 2 weight percent nickel, 0 to 1 weight percent manganese, 0 to 3 weight percent silicon, 0 to 0.2 weight percent carbon, 0 to 1 weight percent titanium, and does not specify the necessity of adding

nitrogen which overlaps "in weight percent, up to 3 nickel, up to 3 manganese, up to 0.7 silicon, up to 0.07 nitrogen, up to 0.07 carbon and up to 0.5 titanium, as instantly claimed (claim 4 of Ono (JP '103)).

In regards to claim 22, Ono (JP '103) discloses 15 to 30 weight percent chromium, 0 to 1 weight percent aluminum and 0 to 0.2 weight percent rare earth metals, which includes cerium and lanthanum, which overlaps "in weight percent, about 22 chromium, about 0.6 aluminum, cerium and lanthanum, wherein the sum of the weights of cerium and lanthanum is up to about 0.10" ([0013], [0017] and [0019]).

In regards to claim 25, Szummer et al. discloses electropolishing a ferritic stainless steel in a sulfuric acid solution with platinum (Materials and experimental procedure).

With respect to the amended recitation "wherein electropolishing the at least one exposed surface improves resistance of the at least one surface to oxidation when subjected to a temperature and an atmosphere characteristic of operating conditions within a solid oxide fuel cell" of claim 26, the Examiner notes Szummer et al. in view of Ono (JP '103) discloses the same or a substantially similar composition and the same processing. Therefore, this property would be expected. MPEP 2112.01 I.

In regards to claim 99, Szummer et al. discloses a method for preparing ferritic stainless steels containing 16 weight percent, 17 weight percent and 19.3 weight percent chromium (page 356, column 2). Ono (JP '103) discloses 15 to 30 weight percent chromium, 0 to 1 weight percent aluminum and 0 to 0.2 weight percent rare earth metals ([0013], [0017] and [0019]).

Ono (JP '103) discloses, in the same field of endeavor, adding 0 to 1 weight percent aluminum and 0 to 0.2 weight percent rare earth metals (which would include cerium, lanthanum, praseodymium) to a ferritic stainless steel alloy, having a substantially similar amount of chromium as Suda (JP '391), to improve oxidation (corrosion) resistance [0017] and [0019].

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added 0 to 1 weight percent aluminum and 0 to 0.2 weight percent rare earth metals, as disclosed by Ono (JP '103), to the ferritic stainless steel, as disclosed by Szummer et al., in order to improve oxidation (corrosion) resistance, as disclosed by Ono (JP '103).

With respect to the recitation "wherein the electropolishing chemically modifies the at least one exposed surface of the ferritic stainless steel so that the electropolished exposed surface develops an aluminum-rich oxide scale when heated in an oxidizing atmosphere at a temperature in the range of 750°C to 850°C, aluminum-rich the oxide scale comprising iron and chromium and having a hematite structure,  $a_o$  in the range of 4.95 to 5.04 Å, and  $c_o$  in the range of 13.58 to 13.75 Å" in claim 99, the Examiner notes that Szummer et al. in view of Ono (JP '103) discloses the same or a substantially similar composition and the same processing. Therefore, this property would be expected. MPEP 2112.01 I. The Examiner further notes that "when heated in an oxidizing atmosphere at a temperature in the range of 750°C to 850°C" would not be an active step in the process as claimed.

In regards to claim 100, Ono (JP '103) discloses oxidizing the ferritic stainless

steel in the vicinity of 1000°C [0005], which would include 850°C. Therefore "an aluminum-rich oxide scale comprising iron and chromium and having a hematite structure  $a_0$  in the range of 4.95 to 5.04 Å and  $c_0$  in the range of 13.58 to 13.75 Å" in Szummer et al. in view of Ono (JP '103) would be expected. MPEP 2112.01 I.

With respect to the recitation "wherein the electropolishing decreases the rate of oxidation of the ferritic stainless steel by at least one order of magnitude when compared to a non-electropolished sample of the same ferritic stainless steel, when heated in an oxidizing atmosphere at a temperature in the range of 750°C to 850°C" in claim 101, the Examiner notes that Szummer et al. in view of Ono (JP '103) discloses the same or a substantially similar composition and the same processing. Therefore, this property would be expected. MPEP 2112.01 I.

Claims 1-5, 9-11, 13, 18, 21, 25-26, 99 and 101 are rejected under 35 U.S.C. 103(a) as being unpatentable over Szummer et al. (Hydrogen surface effects in ferritic stainless steels) in view of Linden et al. (WO 99/10554).

In regards to claims 1 and 10-11, Szummer et al. discloses a method for preparing ferritic stainless steels (which would include uncoated and exposed stainless steel) containing 16 weight percent, 17 weight percent and 19.3 weight percent chromium comprising electropolishing the stainless steel (page 356, column 2).

Szummer et al. discloses a method of preparing ferritic stainless steels as described above, but Szummer et al. does not specify that the ferritic stainless steels would comprise at least 0.2 weight percent aluminum and a total weight of rare earth



metals from 0.02 to 1.0 weight percent.

Linden et al. (WO '554) discloses ferritic stainless steels comprising 15 to 25 weight percent chromium wherein 3 to 7 weight percent aluminum would be added to form a protective oxide layer and 0 to 0.5 weight percent of cerium, lanthanum, yttrium, and hafnium would be added to improve adhesion of the oxide layer (abstract, page 3, lines 15-32, page 4, lines 17-32 and page 7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add 3 to 7 weight percent aluminum and 0 to 0.5 weight percent of cerium, lanthanum, yttrium, and hafnium, as disclosed by Linden et al. (WO '554), to the ferritic stainless steel containing 16 weight percent, 17 weight percent and 19.3 weight percent chromium, as disclosed by Szummer et al., in order to form a protective oxide layer and improve adhesion of the oxide layer, as disclosed by Linden et al. (WO '554) (abstract, page 4, lines 17-32 and page 7).

With respect to the amended recitations "so that, when subjected to an oxidizing atmosphere at high temperature, the exposed electropolished surface develops an electrically conductive, aluminum-rich, oxidation resistant oxide scale comprising chromium and iron and having a hematite structure differing from  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ " as recited in lines 9-13 of claim 1, "wherein lattice parameters differ from  $a_o$  and  $c_o$  of  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ " as recited in claim 2, and "wherein the oxide scale is characterized by lattice parameters  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å" of claim 5, neither Szummer et al. nor Linden et al. (WO '554) specify the hematite structure that would be formed. However,

Szumner et al. in view of Linden et al. (WO '554) does disclose the same or substantially the same composition in addition to the same process (electropolishing). Therefore, it would be expected that Szumner et al. in view of Linden et al. (WO '554) would have the hematite structure and the hematite lattice parameters as claimed in the instant invention. MPEP 2112.01 I.

With respect to the amended recitations "wherein the at least one exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere at a temperature in the range of 750°C to 850°C." of claim 3, "wherein the at least one exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C." of claim 4 and "wherein the exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C, and wherein the oxide scale is characterized by  $a_0$  in the range of 4.95 to 5.04 Å and  $c_0$  in the range of 13.58 to 13.75 Å" of claim 9, the Examiner notes that these recitations would not be an active step in the process as claimed and are therefore considered a property that would result from the electropolishing of a ferritic stainless steel. MPEP 2112.01 I.

With respect to the amended recitation "so that the exposed electropolished surface develops an aluminum-rich oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C, the oxide scale comprising iron and chromium and having a hematite structure,  $a_0$  in the range of 4.95

to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å" of lines 9-13 of claim 10, the Examiner notes that this recitation would not be an active step in the process as claimed and is therefore considered a property that would be the result from the electropolishing of a ferritic stainless steel. MPEP 2112.01 I.

With respect to the amended recitation "wherein the at least one exposed electropolished surface develops an aluminum-rich oxide scale comprising iron and chromium and having a hematite structure  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å, when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C." of claim 13, the Examiner notes that this recitation would not be an active step in the process as claimed and is therefore considered a property that would be the result from the electropolishing of a ferritic stainless steel. MPEP 2112.01 I.

In regards to claim 18, Linden et al. (WO '554) 0 to 0.5 weight percent of cerium, lanthanum, yttrium, and hafnium (abstract and page 7).

In regards to claim 21, Linden et al. (WO '554) discloses less than 2 weight percent nickel, less than 2 weight percent manganese, less than 2 weight percent silicon, less than 0.05 weight percent carbon, 0.005 to 0.03 weight percent titanium, and less than 0.05 weight percent nitrogen which overlaps "in weight percent, up to 3 nickel, up to 3 manganese, up to 0.7 silicon, up to 0.07 nitrogen, up to 0.07 carbon and up to 0.5 titanium, as instantly claimed (page 3, lines 15-32).

In regards to claim 25, Szummer et al. discloses electropolishing a ferritic stainless steel in a sulfuric acid solution with platinum (Materials and experimental

procedure).

With respect to the amended recitation "wherein electropolishing the at least one exposed surface improves resistance of the at least one surface to oxidation when subjected to a temperature and an atmosphere characteristic of operating conditions within a solid oxide fuel cell" of claim 26, the Examiner notes Szummer et al. in view of Linden et al. (WO '554) discloses the same or a substantially similar composition and the same processing. Therefore, this property would be expected. MPEP 2112.01 I.

In regards to claim 99, Szummer et al. discloses a method for preparing ferritic stainless steels containing 16 weight percent, 17 weight percent and 19.3 weight percent chromium (page 356, column 2). Ono (JP '103) discloses 15 to 30 weight percent chromium, 0 to 1 weight percent aluminum and 0 to 0.2 weight percent rare earth metals ([0013], [0017] and [0019]).

Linden et al. (WO '554) discloses ferritic stainless steels comprising 15 to 25 weight percent chromium wherein 3 to 7 weight percent aluminum would be added to form a protective oxide layer and 0 to 0.5 weight percent of cerium, lanthanum, yttrium, and hafnium would be added to improve adhesion of the oxide layer (abstract, page 3, lines 15-32, page 4, lines 17-32 and page 7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add 3 to 7 weight percent aluminum and 0 to 0.5 weight percent of cerium, lanthanum, yttrium, and hafnium, as disclosed by Linden et al. (WO '554), to the ferritic stainless steel containing 16 weight percent, 17 weight percent and 19.3 weight percent chromium, as disclosed by Szummer et al., in order to form a

protective oxide layer and improve adhesion of the oxide layer, as disclosed by Linden et al. (WO '554) (abstract, page 4, lines 17-32 and page 7).

With respect to the recitation "wherein the electropolishing chemically modifies the at least one exposed surface of the ferritic stainless steel so that the electropolished exposed surface develops an aluminum-rich oxide scale when heated in an oxidizing atmosphere at a temperature in the range of 750°C to 850°C, aluminum-rich the oxide scale comprising iron and chromium and having a hematite structure,  $a_o$  in the range of 4.95 to 5.04 Å, and  $c_o$  in the range of 13.58 to 13.75 Å" in claim 99, the Examiner notes that Szummer et al. in view of Linden et al. (WO '554) discloses the same or a substantially similar composition and the same processing. Therefore, this property would be expected. MPEP 2112.01 I. The Examiner further notes that "when heated in an oxidizing atmosphere at a temperature in the range of 750°C to 850°C" would not be an active step in the process as claimed.

With respect to the recitation "wherein the electropolishing decreases the rate of oxidation of the ferritic stainless steel by at least one order of magnitude when compared to a non-electropolished sample of the same ferritic stainless steel, when heated in an oxidizing atmosphere at a temperature in the range of 750°C to 850°C" in claim 101, the Examiner notes that Szummer et al. in view of Linden et al. (WO '554) discloses the same or a substantially similar composition and the same processing. Therefore, this property would be expected. MPEP 2112.01 I.

Claims 1-5, 9-11, 13, 18, 21, 25-26, 99 and 101 are rejected under 35 U.S.C.

103(a) as being unpatentable over Szummer et al. (Hydrogen surface effects in ferritic stainless steels) in view of Uematsu et al. (JP 06-172933).

In regards to claims 1 and 10-11, Szummer et al. discloses a method for preparing ferritic stainless steels (which would include uncoated and exposed stainless steel) containing 16 weight percent, 17 weight percent and 19.3 weight percent chromium comprising electropolishing the stainless steel (page 356, column 2).

Szummer et al. discloses a method of preparing ferritic stainless steels as described above, but Szummer et al. does not specify that the ferritic stainless steels would comprise at least 0.2 weight percent aluminum and a total weight of rare earth metals from 0.02 to 1.0 weight percent.

Uematsu et al. (JP '933) discloses adding 1 to 4.5 weight percent aluminum, to maintain high temperature oxidation resistance, and 0.01 to 0.15 weight percent rare earth metals such as cerium, lanthanum, and yttrium, to improve adhesion of the oxide film, for a ferritic stainless steel having 15 to 25 weight percent chromium ([0012-0013] and [0015-0016]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added 1 to 4.5 weight percent aluminum and 0.01 to 0.15 weight percent rare earth metals such as cerium, lanthanum, and yttrium, as disclosed by Uematsu et al. (JP '933), to the ferritic stainless steels, as disclosed by Szummer et al., in order to maintain high temperature oxidation resistance and improve adhesion of the oxide film, as disclosed by Uematsu et al. (JP '933) (abstract, [0012-0013] and [0015-0016]).

With respect to the amended recitations "so that, when subjected to an oxidizing atmosphere at high temperature, the exposed electropolished surface develops an electrically conductive, aluminum-rich, oxidation resistant oxide scale comprising chromium and iron and having a hematite structure differing from  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ " as recited in lines 9-13 of claim 1, "wherein lattice parameters differ from  $a_o$  and  $c_o$  of  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ " as recited in claim 2, and "wherein the oxide scale is characterized by lattice parameters  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å" of claim 5, neither Szummer et al. nor Uematsu et al. (JP '933) specify the hematite structure that would be formed. However, Szummer et al. in view of Uematsu et al. (JP '933) does disclose the same or substantially the same composition in addition to the same process (electropolishing). Therefore, it would be expected that Szummer et al. in view of Uematsu et al. (JP '933) would have the hematite structure and the hematite lattice parameters as claimed in the instant invention. MPEP 2112.01 I.

With respect to the amended recitations "wherein the at least one exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere at a temperature in the range of 750°C to 850°C." of claim 3, "wherein the at least one exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C." of claim 4 and "wherein the exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in

the range of 750°C to 850°C, and wherein the oxide scale is characterized by  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å" of claim 9, the Examiner notes that these recitations would not be an active step in the process as claimed and is therefore considered a property that would result from the electropolishing of a ferritic stainless steel. MPEP 2112.01 I.

With respect to the amended recitation "so that the exposed electropolished surface develops an aluminum-rich oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C, the oxide scale comprising iron and chromium and having a hematite structure,  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å" of lines 9-13 of claim 10, the Examiner notes that this recitation would not be an active step in the process as claimed and is therefore considered a property that would be the result from the electropolishing of a ferritic stainless steel. MPEP 2112.01 I.

With respect to the amended recitation "wherein the at least one exposed electropolished surface develops an aluminum-rich oxide scale comprising iron and chromium and having a hematite structure  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å, when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C." of claim 13, the Examiner notes that this recitation would not be an active step in the process as claimed and is therefore considered a property that would be the result from the electropolishing of a ferritic stainless steel. MPEP 2112.01 I.



In regards to claim 18, Uematsu et al. (JP '933) discloses 0.01 to 0.15 weight percent rare earth metals such as cerium, lanthanum, and yttrium [0015-0016].

In regards to claim 21, Uematsu et al. (JP '933) discloses 0 to 0.03 weight percent nitrogen, 0 to 0.3 weight percent manganese, 0 to 0.2 weight percent silicon, 0 to 0.03 weight percent carbon, 0.01 to 0.5 weight percent titanium, and does not specify the necessity of adding nickel which overlaps "in weight percent, up to 3 nickel, up to 3 manganese, up to 0.7 silicon, up to 0.07 nitrogen, up to 0.07 carbon and up to 0.5 titanium, as instantly claimed (abstract).

In regards to claim 25, Szummer et al. discloses electropolishing a ferritic stainless steel in a sulfuric acid solution with platinum (Materials and experimental procedure).

With respect to the amended recitation "wherein electropolishing the at least one exposed surface improves resistance of the at least one surface to oxidation when subjected to a temperature and an atmosphere characteristic of operating conditions within a solid oxide fuel cell" of claim 26, the Examiner notes Szummer et al. in view of Uematsu et al. (JP '933) discloses the same or a substantially similar composition and the same processing. Therefore, this property would be expected. MPEP 2112.01 I.

In regards to claim 99, Szummer et al. discloses a method for preparing ferritic stainless steels containing 16 weight percent, 17 weight percent and 19.3 weight percent chromium (page 356, column 2). Ono (JP '103) discloses 15 to 30 weight percent chromium, 0 to 1 weight percent aluminum and 0 to 0.2 weight percent rare earth metals ([0013], [0017] and [0019]).

Uematsu et al. (JP '933) discloses adding 1 to 4.5 weight percent aluminum, to maintain high temperature oxidation resistance, and 0.01 to 0.15 weight percent rare earth metals such as cerium, lanthanum, and yttrium, to improve adhesion of the oxide film, for a ferritic stainless steel having 15 to 25 weight percent chromium ([0012-0013] and [0015-0016]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added 1 to 4.5 weight percent aluminum and 0.01 to 0.15 weight percent rare earth metals such as cerium, lanthanum, and yttrium, as disclosed by Uematsu et al. (JP '933), to the ferritic stainless steels, as disclosed by Szummer et al., in order to maintain high temperature oxidation resistance and improve adhesion of the oxide film, as disclosed by Uematsu et al. (JP '933) (abstract, [0012-0013] and [0015-0016]).

With respect to the recitation "wherein the electropolishing decreases the rate of oxidation of the ferritic stainless steel by at least one order of magnitude when compared to a non-electropolished sample of the same ferritic stainless steel, when heated in an oxidizing atmosphere at a temperature in the range of 750°C to 850°C" in claim 101, the Examiner notes that Szummer et al. in view of Uematsu et al. (JP '933) discloses the same or a substantially similar composition and the same processing. Therefore, this property would be expected. MPEP 2112.01 I.

Claims 1-5, 9-11, 13, 16, 18, 20-22, 25-26, 99 and 101 are rejected under 35 U.S.C. 103(a) as being unpatentable over Szummer et al. (Hydrogen surface effects in ferritic stainless steels) in view of Matsui et al. (JP 09-209092).

In regards to claims 1 and 10-11, Szummer et al. discloses a method for preparing ferritic stainless steels (which would include uncoated and exposed stainless steel) containing 16 weight percent, 17 weight percent and 19.3 weight percent chromium comprising electropolishing the stainless steel (page 356, column 2).

Szummer et al. discloses a method of preparing ferritic stainless steels as described above, but Szummer et al. does not specify that the ferritic stainless steels would comprise at least 0.2 weight percent aluminum and a total weight of rare earth metals from 0.02 to 1.0 weight percent.

Matsui et al. (JP '092) discloses adding 0.01 to 2 weight percent aluminum, in order to improve high temperature oxidation (corrosion) resistance, and 0.001 to 0.05 of rare earth metals such as yttrium, in order to improve the oxide film, to stainless steel having 20 to 80 volume percent ferritic phase (ferritic stainless steel) and 15 to 27 weight percent chromium (abstract and [0018]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added 0.01 to 2 weight percent aluminum and 0.001 to 0.05 weight percent rare earth metals such as yttrium, as disclosed by Matsui et al. (JP '092), to the ferritic stainless steels, as disclosed by Szummer et al., in order to maintain high temperature oxidation resistance and improve adhesion of the oxide film, as disclosed by Matsui et al. (JP '092) (abstract and [0018]).

With respect to the amended recitations "so that, when subjected to an oxidizing atmosphere at high temperature, the exposed electropolished surface develops an electrically conductive, aluminum-rich, oxidation resistant oxide scale comprising

chromium and iron and having a hematite structure differing from  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ ” as recited in lines 9-13 of claim 1, “wherein lattice parameters differ from  $a_o$  and  $c_o$  of  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ ” as recited in claim 2, and “wherein the oxide scale is characterized by lattice parameters  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å” of claim 5, neither Szummer et al. nor Matsui et al. (JP ‘092) specify the hematite structure that would be formed. However, Szummer et al. in view of Matsui et al. (JP ‘092) does disclose the same or substantially the same composition in addition to the same process (electropolishing). Therefore, it would be expected that Szummer et al. in view of Matsui et al. (JP ‘092) would have the hematite structure and the hematite lattice parameters as claimed in the instant invention. MPEP 2112.01 I.

With respect to the amended recitations “wherein the at least one exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere at a temperature in the range of 750°C to 850°C.” of claim 3, “wherein the at least one exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C.” of claim 4 and “wherein the exposed electropolished surface develops the oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C, and wherein the oxide scale is characterized by  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å” of claim 9, the Examiner notes that these recitations would not be an active step in the process as claimed and is

therefore considered a property that would result from the electropolishing of a ferritic stainless steel. MPEP 2112.01 I.

With respect to the amended recitation "so that the exposed electropolished surface develops an aluminum-rich oxide scale when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C, the oxide scale comprising iron and chromium and having a hematite structure,  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å" of lines 9-13 of claim 10, the Examiner notes that this recitation would not be an active step in the process as claimed and is therefore considered a property that would be the result from the electropolishing of a ferritic stainless steel. MPEP 2112.01 I.

With respect to the amended recitation "wherein the at least one exposed electropolished surface develops an aluminum-rich oxide scale comprising iron and chromium and having a hematite structure  $a_o$  in the range of 4.95 to 5.04 Å and  $c_o$  in the range of 13.58 to 13.75 Å, when heated in an oxidizing atmosphere for at least 100 hours at a temperature in the range of 750°C to 850°C." of claim 13, the Examiner notes that this recitation would not be an active step in the process as claimed and is therefore considered a property that would be the result from the electropolishing of a ferritic stainless steel. MPEP 2112.01 I.

In regards to claim 16, Matsui et al. (JP '092) discloses adding 0.01 to 2 weight percent aluminum [0018], which encompasses the newly amended range of 0.4 up to 0.8 weight percent aluminum.

In regards to claim 18, Matsui et al. (JP '092) discloses adding 0.001 to 0.05 of rare earth metals such as yttrium (abstract and [0018]).

In regards to claim 20, Szummer et al. discloses a method for preparing ferritic stainless steels containing 16 weight percent, 17 weight percent and 19.3 weight percent chromium (page 356, column 2). Matsui et al. (JP '092) discloses 15 to 27 weight percent chromium, 0.01 to 2 weight percent aluminum and 0.001 to 0.05 of rare earth metals such as yttrium, which overlaps "in weight percent, 18 up to 22 chromium, 0.4 to 0.8 aluminum and 0.02 to 0.2 REM" as instantly claimed (abstract and [0018]).

In regards to claim 21, Matsui et al. (JP '092) discloses 0.01 to 0.15 weight percent nitrogen, 0.1 to 2 weight percent manganese, 0.1 to 2 weight percent silicon, 0.06 to 0.2 weight percent carbon, 0.01 to 2 weight percent titanium, and 1 to 8 weight percent nickel which overlaps "in weight percent, up to 3 nickel, up to 3 manganese, up to 0.7 silicon, up to 0.07 nitrogen, up to 0.07 carbon and up to 0.5 titanium, as instantly claimed (abstract).

In regards to claim 22, Matsui et al. (JP '092) discloses 15 to 27 weight percent chromium, 0.01 to 2 weight percent aluminum and 0.001 to 0.05 weight percent rare earth metals, which includes cerium and lanthanum, which overlaps "in weight percent, about 22 chromium, about 0.6 aluminum, cerium and lanthanum, wherein the sum of the weights of cerium and lanthanum is up to about 0.10" ([0013], [0017] and [0019]).

In regards to claim 25, Szummer et al. discloses electropolishing a ferritic stainless steel in a sulfuric acid solution with platinum (Materials and experimental

procedure).

With respect to the amended recitation "wherein electropolishing the at least one exposed surface improves resistance of the at least one surface to oxidation when subjected to a temperature and an atmosphere characteristic of operating conditions within a solid oxide fuel cell" of claim 26, the Examiner notes Szummer et al. in view of Matsui et al. (JP '092) discloses the same or a substantially similar composition and the same processing. Therefore, this property would be expected. MPEP 2112.01 I.

In regards to claim 99, Szummer et al. discloses a method for preparing ferritic stainless steels containing 16 weight percent, 17 weight percent and 19.3 weight percent chromium (page 356, column 2). Ono (JP '103) discloses 15 to 30 weight percent chromium, 0 to 1 weight percent aluminum and 0 to 0.2 weight percent rare earth metals ([0013], [0017] and [0019]).

Matsui et al. (JP '092) discloses adding 0.01 to 2 weight percent aluminum, in order to improve high temperature oxidation (corrosion) resistance, and 0.001 to 0.05 of rare earth metals such as yttrium, in order to improve the oxide film, to stainless steel having 20 to 80 volume percent ferritic phase (ferritic stainless steel) and 15 to 27 weight percent chromium (abstract and [0018]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added 0.01 to 2 weight percent aluminum and 0.001 to 0.05 weight percent rare earth metals such as yttrium, as disclosed by Matsui et al. (JP '092), to the ferritic stainless steels, as disclosed by Szummer et al., in order

to maintain high temperature oxidation resistance and improve adhesion of the oxide film, as disclosed by Matsui et al. (JP '092) (abstract and [0018]).

With respect to the recitation "wherein the electropolishing decreases the rate of oxidation of the ferritic stainless steel by at least one order of magnitude when compared to a non-electropolished sample of the same ferritic stainless steel, when heated in an oxidizing atmosphere at a temperature in the range of 750°C to 850°C" in claim 101, the Examiner notes that Szummer et al. in view of Matsui et al. (JP '092) discloses the same or a substantially similar composition and the same processing. Therefore, this property would be expected. MPEP 2112.01 I.

#### **(10) Response to Argument**

Appellant's arguments filed 26 August 2010 have been fully considered but they are not persuasive.

- I. Rejection of claims 11, 13, 16, 18, 20-22, 25 and 26 under 35 U.S.C. §112, first paragraph as failing to comply with the written description requirement

First, the Appellant primarily argues that because the patent specification is written for a person having skill in the art, it is unnecessary to spell out every detail of the invention. The Appellant further argues that in the rejection of claims 11, 13, 16, 18, 20-22, 25 and 26, the Examiner is applying an improper *in haec verba* requirement by stating that the specification does not recite "without a coating" or "uncoated" and therefore arguing that this feature does not have basis in the original disclosure; a



person skilled in the art would have understood the inventor to have been in possession of a method of making a ferritic stainless steel article having an uncoated electropolished oxidation resistant surface at least based on Examples 1 and 2 in the specification, which describe the making of a ferritic stainless steel article having an uncoated, electropolished, and oxidation resistant surface; and the Examiner cites MPEP § 2173.05(i) as allegedly supporting the argument that the specification must literally recite "without a coating" or "uncoated" in order to support claim 11, however this section of the MPEP states "that a lack of literal basis in the specification for a negative limitation may not be sufficient to establish a *prima facie* case for lack of descriptive support."

In response, the Examiner notes that in Example 1, oxide is formed on the electropolished samples and this formed oxide would be a coating [0053]. Therefore, Appellant does not have support for the term "uncoated" in the specification since an oxide coating will form upon exposure to air. With reference to MPEP § 2173.05(i), any negative limitation or exclusionary proviso must have basis in the original disclosure. Since Appellant does not have support for "uncoated" or "without a coating" in the specification, there is no support for the claimed feature and since both samples would be electropolished in Examples 1 and 2, one would expect an oxide coating or film to form on the steel after electropolishing as discussed by the Appellant in [0053] and [0055].

Second, the Appellant primarily argues that the ferritic stainless steel articles made and tested in Examples 1 and 2 in the specification are inherently uncoated and

nowhere does Example 1 or Example 2 describe coating the ferritic stainless steel articles. The Appellant further argues that a person skilled in the art would readily and unambiguously recognize that the "electropolished" samples prepared in Example 1 were, in fact, uncoated; the ferritic stainless steel was cast, hot reduced, cold rolled, annealed, ground, and electropolished and clearly, electropolished samples were never coated in Example 1 and any coating present on the surfaces of the articles would be removed by the grinding, which is performed immediately before electropolishing.

In response, the Examiner notes that in Example 1, oxide is formed on the electropolished samples and this formed oxide would be a coating [0053] and [0055]. Therefore, Appellant does not have support for the term "uncoated" in the specification since an oxide coating will form upon exposure to air. With reference to MPEP § 2173.05(i), any negative limitation or exclusionary proviso must have basis in the original disclosure. Since Appellant does not have support for "uncoated" or "without a coating" in the specification, there is no support for the claimed feature and since both samples would be electropolished in Examples 1 and 2, one would expect an oxide coating or film to form on the steel after electropolishing as discussed by the Appellant in [0053] and [0055].

Third, the Appellant primarily argues that oxide scales chemically develop on the surfaces of ferritic stainless steels and these oxide scales are not coatings, as the term is understood in the art. The Appellant further argues that "coatings" and "scales" are physically different and distinct because a "coating" is a layer of a substance that is physically applied onto a substrate and a "scale" is a layer that chemically develops on

the surface and in the near-surface region of a material as a result of spontaneous chemical reactions with the surrounding environment; a "scale" is not physically applied onto the surface of a substrate like a "coating", but rather a "scale" is produced as the chemical elements that constitute a material chemically react at the material's surface with species such as oxygen in the surrounding environment and in this manner, the surface and near-surface regions of the material chemically transform into a scale layer under certain conditions.

In response, the Examiner notes that although the Appellant seems to be disputing the difference in the definition of "coating" and "scale", the specification refers to the formation of an oxide film in [0053] and [0055]. The issue here is whether or not a "film" as described in the instant specification can be considered a "coating". During patent prosecution, the claims must be given their broadest reasonable interpretation. MPEP 904.01. Additionally, the Appellant failed to provide a definition for "uncoated" that would allow for the presence of a film. Thus, the Examiner has interpreted "coating" or "coated" as including a film, such as the oxide film disclosed in [0053] and [0055] of the specification, according to the definition provided in the dictionary.

## World English Dictionary

**coating** ( kəʊ tɪ ŋ) 

— *n*

1. a layer or film spread over a surface for protection or decoration
2. a heavy fabric suitable for coats

3. *dialect* ( *Midland English* ) a severe rebuke; ticking-off

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- II. Rejection of claims 99-101 under 35 U.S.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter.

The Appellant primarily argues that the language contained in claim 99 contains a typographical error and the recitation "aluminum-rich the oxide scale comprising" should read "the aluminum-rich oxide scale comprising" and the Appellant submits that the Examiner's alleged indefiniteness is due to this typographical error. The Appellant further argues that claim 99 was amended in the Response to the Final Office Action dated January 22, 2010, but the Examiner denied entry of the amendment.

In response, the Examiner agrees that "the aluminum-rich oxide scale comprising" would be clearer than "aluminum-rich the oxide scale comprising". However, Appellant's response filed January 22, 2010 included amendments to other claims that would change the scope of the claims such that the claims would require further consideration by the Examiner based on the change in scope. Therefore, such claim amendments were not entered. Additionally, the Examiner notes that the language in claim 99 makes it unclear as to whether the oxide scales comprises iron and chromium and then is enriched with aluminum, aluminum is present with the iron and chromium in the oxide scale or if only iron and chromium are present in the oxide scale.

III. Rejection of claims 1-5, 9-11, 13, 16, 18, 20-22 and 26 under 35 U.S.C. §103(a) as being unpatentable over Ishibashi (US 4,097,311).

First, the Appellant primarily argues that the processed surface of the substrate in Ishibashi ('311) is not left exposed, but instead is actively coated with a relatively thick layer of metal oxide having certain spectral properties facilitating absorption of solar radiation by the coated surface. The Appellant further argues that there is no disclosure in Ishibashi ('311) related to electrochemical modification of ferritic stainless steels.

In response, the Examiner notes although Ishibashi ('311) may be coated with an oxide film after electrolytic polishing (electropolishing) (col. 7, lines 34-50), the instant invention is also coated with an oxide film [0053] and [0055] of the instant specification. Thus, if both Ishibashi ('311) and the instant invention both have an oxide film then both would be capable of forming the "electrically conductive, aluminum-rich, oxidation resistance oxide scale comprising chromium and iron and having a hematite structure differing from  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ " as claimed. Alternatively, even if the electropolished surface of Ishibashi ('311) is never exposed to an oxidizing atmosphere at higher temperatures, the claim limitations would still be met because the exposure to the oxidizing atmosphere at high temperatures is not a positively recited method limitation in the claim, but rather the formation of "electrically conductive, aluminum-rich, oxidation resistance oxide scale comprising chromium and iron and having a hematite structure differing from  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ " would be expected if this surface were to ever be exposed to an oxidizing atmosphere at high temperatures. Additionally, the Examiner notes that Ishibashi ('311) discloses

electrolytic polishing stainless steels (col. 7, lines 34-50) and discloses that these steels would include austenitic and ferritic stainless steels (col. 11, lines 1-34).

Second, the Appellant primarily argues that the aluminum-rich oxide scale recited in independent claims 1 and 10 would not have been inherently expected from the disclosure presented in Ishibashi ('311); the Examiner's conclusion that the recited composition, crystal structure, and lattice parameters of the scale would be expected according to MPEP §2112.01 I is incorrect; an obviousness rejection cannot be based on a theory of inherency; and the alleged inherent feature must have been taught or suggested in the prior art at the time that the claimed invention was made. The Appellant further argues that in the cases of *In re Rijckaert* and *In re Newel*, the Examiner based an obviousness rejection on a combination of prior art references that failed to teach or suggest certain features recited in the rejected claims and the Examiner argued that these features would have been inherent in the combined disclosures of the prior art and that a person skilled in the art would understand the features to be inherent; The Court held that obviousness cannot be shown based on what is not known in the prior art at the time the invention is made, even if inherency of a certain feature is later established; and here, the distinctive aluminum-rich oxide scale comprising aluminum, chromium, and iron, and having a particular hematite structure, as recited in claims 1 and 10, was not known in the prior art at the time the methods recited in claims 1 and 10 were made; and therefore, an obviousness rejection cannot be supported by the prior art, even if the distinctive aluminum-rich oxide scale would be inherent.

In response, the Examiner notes that because Ishibashi ('311) teaches electrolytically polishing (electropolishing) ferritic stainless steels (col. 7, lines 34-50 and col. 11, lines 1-34) having a composition substantially similar to that of the instant invention "so that, when subjected to an oxidizing atmosphere at high temperature, the exposed electropolished surface develops an electrically conductive, aluminum-rich, oxidation resistant oxide scale comprising chromium and iron and having a hematite structure differing from  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ " would be met because the composition and processing are substantially the same and the recited exposure to an oxidizing atmosphere at a high temperature is not a positively required step to meet the claimed method. MPEP §2112.01 I. Even though a property of an instant invention may not be explicitly taught in a prior art reference wherein the composition and the processing are substantially the same, this does not preclude this property from being expected in the prior art. Additionally, the Examiner notes that the claimed structure would not be expected of the ferritic stainless steel article in its standard room temperature form and the step of oxidizing at a high temperature is not a positively recited required step in the instant method. The Examiner has treated "so that, when" as optional language in accordance with MPEP §2111.04.

Third, the Appellant primarily argues that the Examiner has failed to cite any prior art or other evidence whatsoever that teaches or suggests the formation of an aluminum-rich, oxidation resistant oxide scale comprising aluminum, chromium, and iron, and having a particular hematite structure, as recited in claims 1 and 10. The Appellant further argues that Ishibashi ('311) teaches a different oxide altogether and

therefore Ishibashi ('311) cannot serve as the basis for a *prima facie* case under 35 U.S.C. §103(a); in order for the aluminum-rich oxide scale recited in the claims of the Subject Application to have been inherent, the particular chemistry, crystal structure, and properties of the scale must necessarily exist in the disclosure of Ishibashi ('311) and have been identifiable by a person skilled in the art; and the distinctive aluminum-rich oxide scale recited in claims 1 and 10 of the Subject Application is not taught or suggested in Ishibashi ('311) and the aluminum-rich oxide scale would not have expected as an inherent property by a person skilled in the art.

In response, the Examiner notes that because Ishibashi ('311) teaches electrolytically polishing (electropolishing) ferritic stainless steels (col. 7, lines 34-50 and col. 11, lines 1-34) having a composition substantially similar to that of the instant invention "so that, when subjected to an oxidizing atmosphere at high temperature, the exposed electropolished surface develops an electrically conductive, aluminum-rich, oxidation resistant oxide scale comprising chromium and iron and having a hematite structure differing from  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ ," would be met because the composition and processing are substantially the same and the recited exposure to an oxidizing atmosphere at a high temperature is not a positively required step to meet the claimed method. MPEP §2112.01 I. Even though a property of an instant invention may not be explicitly taught in a prior art reference wherein the composition and the processing are substantially the same, this does not preclude this property from being expected in the prior art. Additionally, the Examiner notes that the claimed structure would not be expected of the ferritic stainless steel article in its standard room



temperature form and the step of oxidizing at a high temperature is not a positively recited required step in the instant method. The Examiner has treated "so that, when" as optional language in accordance with MPEP §2111.04.

Fourth, the Appellant primarily argues that 0.02 to 1.0 weight percent aluminum and 0.02 to 1.0 weight percent of at least one rare earth metal is critical for the development of the distinctive aluminum-rich oxide scale on the electropolished surfaces of ferritic stainless steels and the resulting high temperature oxidation resistance properties. The Appellant further argues that Ishibashi ('311) does not teach or suggest providing a ferritic stainless steel comprising these critical levels of aluminum and rare earth metals, as recited in claims 1, 10 and 11; Ishibashi ('311) discloses steel compositions that may include 0.001 to 5.00 weight percent aluminum and 0.001 to 5.00 weight percent yttrium and the chemistry is extremely broad; and there is no disclosure that would lead a person skilled in the art to experiment, optimize, or otherwise determine the critical ranges for aluminum and rare earth elements, as recited in claims 1, 10 and 11.

In response, the Examiner notes that the Appellant has failed to provide unexpected results with regard to the claimed ranges of 0.2 to 1.0 weight percent aluminum and 0.02 to 1.0 weight percent of at least one rare earth metal. To establish unexpected results over a claimed range, Appellants should compare a sufficient number of tests both inside and outside the claimed range to show the criticality of the claimed range. MPEP §716.02(d)(II). Absent this showing, the Examiner asserts that the disclosure in Ishibashi ('311) disclosing 0.001 to 5 weight percent of at least one

element selected from the group of nitrogen, copper, aluminum, vanadium, yttrium, titanium, niobium, tantalum, uranium, tungsten, zirconium and hafnium would be sufficient to establish a *prima facie* evidence of obviousness. MPEP §2144.05 I.

Fifth, the Appellant primarily argues that the Examiner asserts that it would have been obvious to select the claimed narrow ranges of aluminum and rare earth elements from the broad ranges of aluminum and yttrium in Ishibashi ('311) because Ishibashi ('311) "discloses the same utility throughout the disclosed ranges" and Appellant disagrees because Ishibashi ('311) does not disclose any utility for aluminum and yttrium, let alone the same utility as described in the instant specification. The Appellant further argues that aluminum and yttrium are among an unspecific and undifferentiated list of thirteen alloying elements that may be present in stainless steels in concentrations ranging from 0.001 to 5.00 weight percent.

In response, the Examiner notes that "discloses the same utility throughout the disclosed ranges" is in reference to the electropolishing of a ferritic stainless steel which is disclosed in Ishibashi ('311) and the instant invention and not with regard to the specific utility of the elements of aluminum and yttrium. Additionally, the Examiner notes that Appellant's requirement of at least one rare earth metal would include a list of seventeen unspecific and undifferentiated alloying elements including scandium, yttrium, lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, and lutetium that may be present in the stainless steel in an amount between 0.001 and 1

weight percent. Thus, the alloys in Appellant's claims are as broad, if not broader than the alloys of Ishibashi ('311).

Sixth, the Appellant primarily argues that the specification shows that 0.2 to 1.0 weight percent aluminum and 0.02 to 1.0 weight percent of at least one rare earth metal is critical for the formation of the distinctive aluminum-rich oxide scale on the electropolished surfaces of ferritic stainless steels and the significant improvement in high temperature oxidation resistance and these narrower concentrations correlate with unexpected results, i.e., the distinctive aluminum-rich oxide scale that develops on the electropolished surfaces of ferritic stainless steels and the significant improvement in high temperature oxidation resistance properties, which are not taught or suggested in the cited prior art. The Appellant further argues that a person skilled in the art would not have found it obvious to select these critical narrow ranges from the broad 0.001 to 5.00 weight percent described in Ishibashi ('311) for alloying elements that do not have any disclosed utility whatsoever and a person skilled in the art would have had no basis in technological fact to identify and select the narrow ranges from the broader ranges given that the prior art does not identify any utility for aluminum and rare earth metals, let alone the distinctive oxide scale and the significant improvement in the high temperature oxidation resistance, recited in claims 1, 10 and 11.

In response, the Examiner notes that the Appellant has failed to provide unexpected results with regard to the claimed ranges of 0.2 to 1.0 weight percent aluminum and 0.02 to 1.0 weight percent of at least one rare earth metal. To establish unexpected results over a claimed range, Appellants should compare a sufficient

number of tests both inside and outside the claimed range to show the criticality of the claimed range. MPEP 716.02(d)(II). Absent this showing, the Examiner asserts that the disclosure in Ishibashi ('311) disclosing 0.001 to 5 weight percent of at least one element selected from the group of nitrogen, copper, aluminum, vanadium, yttrium, titanium, niobium, tantalum, uranium, tungsten, zirconium and hafnium would be sufficient to establish a *prima facie* evidence of obviousness. MPEP 2144.05 I. Additionally, the Examiner notes that because Ishibashi ('311) teaches electrolytically polishing (electropolishing) ferritic stainless steels (col. 7, lines 34-50 and col. 11, lines 1-34) having a composition substantially similar to that of the instant invention "so that, when subjected to an oxidizing atmosphere at high temperature, the exposed electropolished surface develops an electrically conductive, aluminum-rich, oxidation resistant oxide scale comprising chromium and iron and having a hematite structure differing from  $\text{Fe}_2\text{O}_3$ , alpha  $\text{Cr}_2\text{O}_3$ , and alpha  $\text{Al}_2\text{O}_3$ " would be met because the composition and processing are substantially the same and the recited exposure to an oxidizing atmosphere at a high temperature is not a positively required step to meet the claimed method. MPEP §2112.01 I. Even though a property of an instant invention may not be explicitly taught in a prior art reference wherein the composition and the processing are substantially the same, this does not preclude this property from being expected in the prior art. Finally, the Examiner notes that the claimed structure would not be expected of the ferritic stainless steel article in its standard room temperature form and the step of oxidizing at a high temperature is not a positively recited required

step in the instant method. The Examiner has treated "so that, when" as optional language in accordance with MPEP §2111.04.

Seventh, the Appellant primarily argues that the MPEP does not have the force and effect of law regarding patentability; section §2144.05 (I) of the MPEP provides that in a case where the claimed ranges overlap or lie inside ranges disclosed by the prior art, a *prima facie* case of obviousness exists; and whiles these MPEP passages, considered in isolation, arguably support the Examiner's rejections, a review of the underlying cases reveals that the present case involving the subject application is readily distinguishable. The Appellant further argues that in cases cited in MPEP §2144.05 (I) in which a *prima facie* case of obviousness was found based on overlapping ranges, the overlap was substantial and/or the prior art range was relatively narrow; the Appellant cites *In re Wertheim*, 541 F.2d 257 (CCPA 1976) (claimed ranges of 0.4-0.8 gm/cc and 28-60% solids content held obvious in view of prior art 0.1 gm/cc and 30% solids), *In re Woodruff*, 919 F.2d 1575 (Fed. Cir. 1990) (claimed range of 5-25% carbon monoxide held obvious in view of prior art 1-5% carbon monoxide), *Titanium Metals Corp. of America V. Banner*, 778 F.2d 775 (Fed. Cir. 1985) (claimed titanium alloy having 0.8% Ni and 0.3% Mo held obvious in view of two (2) prior art titanium alloys, one having 0.75% Ni and 0.25% Mo, and the other having 0.94% Ni and 0.31% Mo); and indicates that in each of these cases the claimed ranges or specific compositions very closely approximated those disclosed in the prior art and in most of the cases the claimed ranges were substantially broader than the ranges disclosed in the prior art.

In response, the Examiner asserts that the standard by which Applications are to be examined is set forth in the MPEP and although there have been some decisions rendered in cases where the claimed ranges overlap or lie inside ranges disclosed by prior art references, the interpretation of the MPEP is not limited to these instances. The Examiner notes that the Appellant failed to mention that "a *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties" (MPEP 2144.05 I) and ""The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages." (MPEP 2144.05 II). Additionally, the Examiner notes that Appellant's requirement of at least one rare earth metal would include a list of seventeen unspecific and undifferentiated alloying elements including scandium, yttrium, lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, and lutetium that may be present in the stainless steel in an amount between 0.001 and 1 weight percent. Thus, the alloys in Appellant's claims are as broad, if not broader than the alloys of Ishibashi ('311).

Eighth, the Appellant primarily argues that the ranges disclosed in Ishibashi ('311) are so broad and unspecific that it would require non-obvious invention to arrive at the ranges recited in the subject application and Ishibashi ('311) fails to identify any result effective variable that could be optimized to arrive at the ranges recited in the claims of the subject application. The Appellant further argues that there is no

suggestion in Ishibashi ('311) that aluminum and yttrium concentration correlate to any recognized result that may be optimized, let alone correlating aluminum and yttrium concentration to oxidation resistance and the development of a distinctive oxide scale on electropolished surfaces under oxidizing conditions and therefore the Examiner's optimization argument is improper because Ishibashi ('311) does not recognize aluminum and yttrium concentrations as achieving any recognized result.

In response, the Examiner notes that Ishibashi ('311) discloses that elements such as aluminum and yttrium improve corrosion resistance (col. 3, lines 55-69). Additionally, the Examiner notes that the Appellant has failed to provide unexpected results commensurate in scope with the pending claims with regard to the claimed ranges of 0.2 to 1.0 weight percent aluminum and 0.02 to 1.0 weight percent of at least one rare earth metal. To establish unexpected results over a claimed range, Appellants should compare a sufficient number of tests both inside and outside the claimed range to show the criticality of the claimed range. MPEP §716.02(d)(II). Additionally, the Examiner notes that Appellant's requirement of at least one rare earth metal would include a list of seventeen unspecific and undifferentiated alloying elements including scandium, yttrium, lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, and lutetium that may be present in the stainless steel in an amount between 0.001 and 1 weight percent. Thus, the alloys in Appellant's claims are as broad, if not broader than the alloys of Ishibashi ('311).

Ninth, the Appellant primarily argues that the mechanically polished, chemically abraded, and electropolished surface of the substrate in Ishibashi ('311) is not left unexposed to develop an oxide scale, but instead is coated with a layer of metal oxide material. The Appellant further argues that a coating step would block the electropolished surface from reacting with oxygen to develop the recited oxide scale, which would eliminate this feature from the claims and thus "comprising" would not be open to a coating step and the Examiner must consider all of the words and features recited in a claim in judging the patentability of the claim against the prior art; and the features (1) an exposed electropolished surface of a ferritic stainless steel that, under certain conditions, develops an aluminum-rich oxide scale comprising chromium and iron and having a hematite structure, and/or (2) an uncoated electropolished surface would not be technologically possible with a coated surface as described in Ishibashi ('311).

In response, the Examiner notes that both the instant invention ([0053] and [0055]) and Ishibashi ('311) (col. 7, lines 34-50) both have an oxide film and thus neither Ishibashi ('311) nor the instant invention would be "uncoated". Additionally, it appears that the oxide film formed in the instant invention would not block the electropolished surface from forming the recited oxide scale. Thus, why would the oxide film in Ishibashi ('311) block the electropolished surface from reacting with oxygen to form the recited oxide scale? Second, the Examiner notes that because Ishibashi ('311) teaches electrolytically polishing (electropolishing) ferritic stainless steels (col. 7, lines 34-50 and col. 11, lines 1-34) having a composition substantially similar to that of the instant



invention "so that, when subjected to an oxidizing atmosphere at high temperature, the exposed electropolished surface develops an electrically conductive, aluminum-rich, oxidation resistant oxide scale comprising chromium and iron and having a hematite structure differing from  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ " would be met because the composition and processing are substantially the same and the recited exposure to an oxidizing atmosphere at a high temperature is not a positively required step to meet the claimed method. MPEP §2112.01 I. Even though a property of an instant invention may not be explicitly taught in a prior art reference wherein the composition and the processing are substantially the same, this does not preclude this property from being expected in the prior art. Third, the Examiner notes that the claimed structure would not be expected of the ferritic stainless steel article in its standard room temperature form and the step of oxidizing at a high temperature is not a positively recited required step in the instant method. The Examiner has treated "so that, when" as optional language in accordance with MPEP §2111.04. Finally, the transitional term "comprising", which is synonymous with "including," "containing," or "characterized by," is inclusive or open-ended and does not exclude additional, un-recited elements or method steps. MPEP §2111.03.

- IV. Rejection of claims 1, 10, 11 and 99 under 35 U.S.C. §103(a) as being unpatentable over Szummer et al. in view of Ono et al. (JP '103), Linden et al. (WO '554), Uematsu et al. (JP '933) or Matsui et al. (JP '092).

First, the Appellant primarily argues that Szummer et al. describes using electropolishing to prepare steel specimens for studying the "surface microstructure of ferritic chromium stainless steel subjected to hydrogen charging" and then argues that there is no disclosure in Szummer et al. or the secondary references related to electrochemical modification of ferritic stainless steels.

In response, the Examiner notes that Szummer et al. discloses electropolishing (electrochemical modification) a ferritic stainless steel in a sulfuric acid solution with platinum (Materials and experimental procedure).

Second, the Appellant primarily argues that Linden et al. (WO '554) and Uematsu et al. (JP '933) teach 3 to 20 weight and 1 to 4.5 weight percent aluminum, respectively whereas claims 1, 10 and 11 recite 0.2 to 1.0 weight percent, and claim 99 recites 0.4 to 0.8 weight percent aluminum and therefore the aluminum concentrations disclosed in Linden et al. (WO '554) do not overlap with any of the aluminum concentration ranges in the claims of the subject application. The Appellant further argues that the aluminum concentrations disclosed in Uematsu et al. (JP '933) do not overlap with the aluminum concentration range recited in claim 99 and the Examiner cannot rely on MPEP 2144.05 to establish a *prima facie* case of obviousness and therefore the rejections under 35 U.S.C. §103(a) based on Szummer et al. in view of Linden et al. (WO '554) and Szummer et al. in view of Uematsu et al. (JP '933) are improper and must be reversed.

In response, the Examiner notes that Linden et al. (WO '554) discloses an alloy having 0.49 weight percent aluminum (Alloy B of Table 1) and that the aluminum content would be result-effective in terms of the workability of the alloy (page 7 of

Linden et al. (WO '554). MPEP 2144.05 II. Thus, Linden et al. (WO '554) does disclose aluminum concentrations that are within that of the subject application. Additionally, the Examiner notes that Uematsu et al. (JP '933) discloses an alloy having 0.81 weight percent aluminum (Alloy 12 of Table 2) and 0.81 weight percent aluminum would be close enough to 0.80 weight percent aluminum to establish *prima facie* evidence of obviousness. Finally, the Examiner notes that the broad disclosure of Uematsu et al. (JP '933) teaches 1 to less than 4.5 weight percent aluminum and thus the broad disclosure would apply at least to independent claims 1, 10 and 11.

Third, the Appellant primarily argues that the purpose of the study described in Szummer et al. was to investigate the microstructure of hydrogen-charged metallic alloy and the Examiner's asserted reasons for combining Szummer et al. with the secondary references and modifying the chemical composition of the alloy described in Szummer et al. are inconsistent with the study.

In response, the Examiner notes that the reasons for combining Szummer et al. with the secondary references are not inconsistent with the study because since the disclosure of Szummer et al. is drawn to the investigation of the surface H-charged microstructure (abstract and 2. Materials and experimental procedure) and the presence of a surface with minimal corrosion due to the presence of aluminum prior to mechanically polishing and electropolishing would be easier to process/investigate than a surface with greater than minimal corrosion due to the lack of elements providing oxidation resistance. Additionally, the presence of a corroded surface would negatively impact the microhardness of that surface, thus compromising the results of the study

since the study investigates the effect of hydrogen upon microhardness. Finally, applying a known technique to a known product ready for improvement to yield predictable results supports this conclusion of obviousness. MPEP 2141 III.

Fourth, the Appellant primarily argues that the Examiner asserts that the combination of Szummer et al. and Linden et al. (WO '554), Uematsu et al. (JP '933) or Matsui et al. (JP '092) would have been obvious in order to form a protective oxide layer, improve adhesion of the oxide layer, and maintain high temperature oxidation resistance, but the investigators performing the study described in Szummer et al. used polishing and electropolishing to remove surface oxides in order to charge the alloy surface with hydrogen and perform microscopic analysis of the hydrogen-charged surfaces. The Appellant further argues that modifying the study described in Szummer et al. in order to increase the formation and adhesion of an oxide layer would be counterproductive to the performance of the disclosed study because it would be more difficult to produce smooth, reflective, and oxide-free alloy surfaces for hydrogen-charging and microscopy.

In response, the Examiner first notes that Szummer et al. is drawn to the investigation of the surface H-charged microstructure (abstract and 2. Materials and experimental procedure) and the presence of a surface with minimal corrosion due to the presence of aluminum prior to mechanically polishing and electropolishing would be easier to process/investigate than a surface with greater than minimal corrosion due to the lack of elements providing oxidation resistance as such as those set forth in Linden et al. (WO '554), Uematsu et al. (JP '933) and Matsui et al. (JP '092). Additionally, the

presence of a corroded surface would negatively impact the microhardness of that surface, thus compromising the results of the study since the study investigates the effect of hydrogen upon microhardness. Finally, applying a known technique to a known product to yield predictable results supports a conclusion of obviousness. MPEP 2141 III.

Fifth, the Appellant primarily argues that Szummer et al. in view of the secondary references does not teach or suggest electropolishing as a step in a "method for making a ferritic stainless steel article having an oxidation resistant surface" as recited in claims 1, 10, 11 and 99. The Appellant further argues that Szummer et al. in view of the secondary references lacks any teaching, suggestion, or motivation whatsoever to use electropolishing on a ferritic stainless steel alloy comprising controlled levels of 0.2 to 1.0 weight percent aluminum and 0.02 to 1.0 weight percent total rare earth metal, in order to produce an oxidation resistant surface as recited in claims 1, 10, 11 and 99.

In response, the Examiner notes that the recitation "for making a ferritic stainless steel article having an oxidation resistant surface" is merely considered an intended purpose of the claimed method steps. MPEP 2111.02 II. Additionally, the Examiner notes that the presence of a surface with minimal corrosion due to the presence of aluminum prior to mechanically polishing and electropolishing would be easier to process/investigate than a surface with greater than minimal corrosion due to the lack of elements providing oxidation resistance as such as those set forth in Linden et al. (WO '554), Uematsu et al. (JP '933) and Matsui et al. (JP '092). Additionally, the presence of a corroded surface would negatively impact the microhardness of that surface, thus

compromising the results of the study since the study investigates the effect of hydrogen upon microhardness. Finally, applying a known technique to a known product to yield predictable results supports a conclusion of obviousness. MPEP 2141 III.

Sixth, the Appellant primarily argues that the Examiner maintains that a person skilled in the art would expect that the electropolished steel of Szummer et al. in view of the secondary references would have the same features as recited in the present claims because, allegedly, the same process is conducted on substantially the same composition. But the Examiner does not explain why or how a person skilled in the art would expect this considering that Szummer et al. does not recognize any effect of electropolishing on high temperature oxidation resistance, let alone resulting in a chemical modification that results in the development of a distinct aluminum-rich oxide scale.

In response, the Examiner notes that when a substantially similar prior art composition relative to an instant invention is processed in the same manner (electropolishing) as the instant invention, substantially similar results are expected. MPEP 2112.01 I. Additionally, the Examiner notes that line 7 of claim 1 recites 'so that when subjected to an oxidizing atmosphere at high temperature'; line 2 of claim 3-4 recite "when heated"; lines 2-3 of claim 9 recite "when heated in an oxidizing atmosphere"; lines 7-8 of claim 10 recites "so that the exposed electropolished surface develops an aluminum-rich oxide scale when heated in an oxidizing atmosphere"; line 4 of claim 13 recited "when heated in an oxidizing atmosphere"; and lines 3-4 of claim 26 recite "when subjected to a temperature and an atmosphere characteristic of operating

conditions within a solid oxide fuel cell". Thus, the step of heating under oxidizing conditions at a high temperature is not a positively recited required step in the instant method and thus the Examiner has treated this language as optional language in accordance with MPEP §2111.04. Thus, an explanation as to why or how a person skilled in the art would expect this considering that Szummer et al. does not recognize any effect of electropolishing on high temperature oxidation resistance is not necessary since the instant method does not require oxidizing at high temperatures.

Seventh, the Appellant primarily argues that the Examiner has failed to cite any prior art or other evidence whatsoever that teaches or suggests the formation of an aluminum-rich oxide scale comprising aluminum, chromium, and iron and having a particular hematite structure as recited in claims 1, 10 and 99. The Appellant further argues that Szummer et al. teaches removing oxides and charging steel surfaces with hydrogen and the distinctive aluminum-rich oxide scale recited in independent claims 1, 10 and 99 would not have been expected as an inherent property by a person skilled in the art.

In response, the Examiner notes that the formation of the aluminum-rich oxide scale comprising aluminum, chromium, and iron with the particular hematite structure would occur only after exposure to a high temperature oxidizing atmosphere and since this step is not actively claimed and the Examiner has provided prior art having the composition and electrolytic polishing or electropolishing as claimed, the Examiner has met the burden of establishing a *prima facie* case. Additionally, the Examiner notes that although Szummer et al. may teach removing oxides and charging the steel surfaces

with hydrogen this does not preclude the formation of oxide at a later point such as, but not limited to, when heated in an oxidizing atmosphere.

Eighth, the Appellant primarily argues that Example 1 in the Specification [0052]-[0058] shows that the rate of high temperature oxidation of electropolished samples of a ferritic stainless steel having a composition that falls within the recited compositional ranges was several orders of magnitude lower than that of otherwise identical non-electropolished samples and this reduction was unexpected and surprising because there is no disclosure in the prior art that teaches or suggests such an improvement in high temperature oxidation resistance due to electropolishing and Figure 5 of the subject application shows that the electropolished samples oxidized at a substantially lower rate than the non-electropolished samples.

In response, the Examiner notes that the prior art teaches electropolishing ferritic stainless steel. However, the Appellant has failed to demonstrate the criticality of the claimed ranges for aluminum and the rare earth metals. The alloy of Example 1 and Figure 5, AL 453<sup>TM</sup>, has 0.6 weight percent aluminum and 0.06 weight percent maximum of cerium plus lanthanum (See Table 1 of subject application). Thus, it would appear that the rare earth metal content would not be critical to the processing of the ferritic stainless steel since no rare earth metal can be present in AL 453<sup>TM</sup> alloy and it is unclear if the aluminum is critical to the processing of the ferritic stainless steel since only one point, 0.6 weight percent aluminum, is provided. To establish unexpected results over a claimed range, Appellants should compare a sufficient number of tests



both inside and outside the claimed range to show the criticality of the claimed range.

MPEP 716.02(d)(II).

Ninth, the Appellant primarily argues that Example 2 in the specification [0059]-[0064] shows that the rate of high temperature oxidation of electropolished samples of a ferritic stainless steel having a composition that falls within the recited compositional ranges was significantly lower than that of otherwise identical non-electropolished samples.

In response, the Examiner notes that the prior art teaches electropolishing ferritic stainless steel. However, the Appellant has failed to demonstrate the criticality of the claimed ranges for aluminum and the rare earth metals. The alloy of Example 2, AL 453<sup>TM</sup>, has 0.6 weight percent aluminum and 0.06 weight percent maximum of cerium plus lanthanum (See Table 1 of subject application). Thus, it would appear that the rare earth metal content would not be critical to the processing of the ferritic stainless steel since no rare earth metal can be present in AL 453<sup>TM</sup> alloy and it is unclear if the aluminum is critical to the processing of the ferritic stainless steel since only one point, 0.6 weight percent aluminum, is provided. To establish unexpected results over a claimed range, Appellants should compare a sufficient number of tests both inside and outside the claimed range to show the criticality of the claimed range. MPEP 716.02(d)(II).

Tenth, the Appellant primarily argues that Figures 7 and 8 show that the electropolished samples oxidized at a substantially lower rate than the non-electropolished samples, including mechanically polished samples.

In response, the Examiner notes that the prior art teaches electropolishing ferritic stainless steel. However, the Appellant has failed to demonstrate the criticality of the claimed ranges for aluminum and the rare earth metals. The alloy of Figures 7 and 8, AL 453<sup>TM</sup>, has 0.6 weight percent aluminum and 0.06 weight percent maximum of cerium plus lanthanum (See Table 1 of subject application). Thus, it would appear that the rare earth metal content would not be critical to the processing of the ferritic stainless steel since no rare earth metal can be present in AL 453<sup>TM</sup> alloy and it is unclear if the aluminum is critical to the processing of the ferritic stainless steel since only one point, 0.6 weight percent aluminum, is provided. To establish unexpected results over a claimed range, Appellants should compare a sufficient number of tests both inside and outside the claimed range to show the criticality of the claimed range. MPEP 716.02(d)(II).

Eleventh, the Appellant primarily argues that Example 3 in the specification [0065]-[0068] presents X-ray diffractometry analysis of the distinctive golden colored oxide scale that develops on electropolished ferritic stainless steels having a composition that falls within the compositional ranges recited in the claims. The Appellant further argues that the analysis shows that the distinctive golden-colored oxide scale is aluminum-rich, comprises aluminum, chromium, and iron, and is of a single phase having a hematite structure; the hematite structure is shown to be different than that of  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ ; the measured lattice parameters of the distinctive aluminum-rich oxide scale are different than that of  $\text{Fe}_2\text{O}_3$ ,  $\alpha\text{-Cr}_2\text{O}_3$ , and  $\alpha\text{-Al}_2\text{O}_3$ ; and the development of this distinctive aluminum-rich oxide scale was

unexpected and surprising because there is no disclosure in the prior art that teaches or suggests the development of such a scale due to electropolishing.

In response, the Examiner notes that the prior art teaches electropolishing ferritic stainless steel. However, the Appellant has failed to demonstrate the criticality of the claimed ranges for aluminum and the rare earth metals. The alloy of Example, AL 453<sup>TM</sup>, has 0.6 weight percent aluminum and 0.06 weight percent maximum of cerium plus lanthanum (See Table 1 of subject application). Thus, it would appear that the rare earth metal content would not be critical to the processing of the ferritic stainless steel since no rare earth metal can be present in AL 453<sup>TM</sup> alloy and it is unclear if the aluminum is critical to the processing of the ferritic stainless steel since only one point, 0.6 weight percent aluminum, is provided. To establish unexpected results over a claimed range, Appellants should compare a sufficient number of tests both inside and outside the claimed range to show the criticality of the claimed range. MPEP 716.02(d)(II). Additionally, the Examiner notes that the formation of the aluminum-rich oxide scale comprising aluminum, chromium, and iron with the particular hematite structure would occur only after exposure to a high temperature oxidizing atmosphere and since this step is not actively claimed and the Examiner has provided prior art having the composition and electrolytic polishing or electropolishing as claimed, the Examiner has met the burden of establishing a *prima facie* case.

Twelfth, the Appellant primarily argues that Example 4 in the specification [0069]-[0073] shows that certain ferritic stainless steel chemistries are critical to the formation of the distinctive aluminum-rich oxide scale and the unexpected and significant

improvement in oxidation resistance and in paragraph [0071] it is shown that 0.2 to 1.0 weight percent aluminum is required for the development of distinctive aluminum-rich oxide scale and the unexpected and significant improvement in oxidation resistance and thus it is shown that 0.2 to 1.0 weight percent aluminum and 0.02 to 1.0 weight percent total rare earth metal are necessary to achieve the unexpected improvement in oxidation resistance without sacrificing electrical conductivity or resulting in over-oxidation. The Appellant further argues that the features shown in the specification as correlating with the unexpected and surprising development of the distinctive aluminum-rich oxide scale and the significant improvement in oxidation resistance are all recited in the claims of the subject application and these features and unexpected results are confirmed by the uncontroverted expert testimony of Michael P. Brady, Ph.D. and the claims should be allowed.

In response, the Examiner notes that Heat Number RV1908 has 0.78 weight percent aluminum and 0.062 weight percent cerium + lanthanum, Heat Number RV 1909 has 0.69 weight percent aluminum and 0.028 weight percent cerium + lanthanum, Heat Number RV1912 has 0.68 weight percent aluminum and 0.002 weight percent cerium + lanthanum, Heat Number RV1917 has 0.32 weight percent aluminum and 0.063 weight percent cerium + lanthanum, Heat Number RV1929 has 0.95 weight percent aluminum and 0.063 weight percent cerium + lanthanum, and Heat AL 453 (nominal) has 0.78 weight percent aluminum and 0.05 weight percent cerium + lanthanum and according to Figure 10 and that corresponding section of the specification [0038], it is unclear what points are associated with each alloy.

Furthermore, to establish unexpected results over a claimed range, Appellants should compare a sufficient number of tests both inside and outside the claimed range to show the criticality of the claimed range. MPEP 716.02(d)(II). This has not been done in Example 4 or Figure 10. Additionally, the Examiner notes that the formation of the aluminum-rich oxide scale comprising aluminum, chromium, and iron with the particular hematite structure would occur only after exposure to a high temperature oxidizing atmosphere and since this step is not actively claimed and the Examiner has provided prior art having the composition and electrolytic polishing or electropolishing as claimed, the Examiner has met the burden of establishing a *prima facie* case.

Thirteenth, the Appellant primarily argues that the Examiner has improperly ignored the expert testimony of Michael P. Brady, Ph.D., submitted via declaration on August 23, 2007, which is evidence that the distinctive aluminum-rich oxide scale and the significant improvement in high temperature oxidation resistance recited in the claims of the subject application would, in fact, have been unexpected before the subject application. The Appellant further argues that Dr. Brady testifies that prior to the filing date of the subject application, metallurgists did not believe that the high temperature oxidation resistance of ferritic stainless steel would be improved by electropolishing.

In response, the Examiner notes that the formation of the aluminum-rich oxide scale on the surface of the ferritic stainless steel is optional because the Appellant does not claim the active step of subjecting the steel to a high temperature oxidizing atmosphere and therefore, the Declaration is not commensurate in scope with the

claims and the Declaration is not persuasive because it fails to set forth evidence to substantiate the conclusory statements set forth therein.

Fourteenth, the Appellant primarily argues that in addition to providing his own expert opinion on the subject, Dr. Brady references scientific journals in his testimony confirming that persons having ordinary skill in the metallurgical arts believed that roughening the surface of metallic alloys, and not flattening the surface would improve oxidation resistance.

In response, the Examiner notes that the documents cited by Dr. Brady "The Effect of Alloy Grain-Size and Surface Deformation on the Selective Oxidation of Chromium in Ni-Cr Alloys at Temperatures of 900° and 1000°C" by C.S. Giggins et al. and "The Effect of Surface Preparation on the Oxidation Behavior of Gamma TiAl-Base Intermetallic Alloys" by J.M. Rakowski et al. are drawn to nickel and titanium alloys whereas the alloys of the instant invention are ferritic stainless steels. Therefore, it has not been established why people in the metallurgical arts believed that roughening the surface of a stainless steel, which is an iron base alloy, would improve oxidation resistance since the documents cited relate to the processing of nickel-base alloys and titanium-base alloys none of these documents refer to stainless steels much less ferritic stainless steels.

Fifteenth, the Appellant primarily argues that the present record lacks any evidence whatsoever that would support a prior recognition or suggestion in the art that the oxidation resistance of ferritic stainless steel having the composition recited in the claim of the subject application or, for that matter, any other ferritic stainless steel,

would be improved by electropolishing. The Appellant further argues that the references cited by Dr. Brady found the results reported in the subject application to be unexpected and surprising as would any ordinarily skilled person in the metallurgical arts.

In response, the Examiner notes that the recitation "for making a ferritic stainless steel article having an oxidation resistant surface" is merely considered an intended purpose of the claimed method steps. MPEP 2111.02 II. Additionally, the Examiner notes that the documents cited by Dr. Brady "The Effect of Alloy Grain-Size and Surface Deformation on the Selective Oxidation of Chromium in Ni-Cr Alloys at Temperatures of 900° and 1000°C" by C.S. Giggins et al. and "The Effect of Surface Preparation on the Oxidation Behavior of Gamma TiAl-Base Intermetallic Alloys" by J.M. Rakowski et al. are drawn to nickel and titanium alloys whereas the alloys of the instant invention are ferritic stainless steels. Therefore, it has not been established why people in the metallurgical arts believed that roughening the surface of a stainless steel, which is an iron base alloy, would improve oxidation resistance since the documents cited relate to the processing of nickel-base alloys and titanium-base alloys none of these documents refer to stainless steels much less ferritic stainless steels.

Sixteenth, the Appellant primarily argues that expert testimony provided in a declaration is independent evidence that is entitled to appropriate weight and the Examiner's argument that the testimony itself is unpersuasive is an improper argument because the determination of patentability must be made based on the evidence as a whole, not on the ability of each argument and piece of evidence to knock down any alleged *prima facie* case.

In response, the Examiner asserts that the expert testimony provided in the declaration has been given proper weight. The Examiner notes that the recitation "for making a ferritic stainless steel article having an oxidation resistant surface" is merely considered an intended purpose of the claimed method steps. MPEP 2111.02 II. Additionally, the Examiner notes that the documents cited by Dr. Brady "The Effect of Alloy Grain-Size and Surface Deformation on the Selective Oxidation of Chromium in Ni-Cr Alloys at Temperatures of 900° and 1000°C" by C.S. Giggins et al. and "The Effect of Surface Preparation on the Oxidation Behavior of Gamma TiAl-Base Intermetallic Alloys" by J.M. Rakowski et al. are drawn to nickel and titanium alloys whereas the alloys of the instant invention are ferritic stainless steels. Therefore, it has not been established why people in the metallurgical arts believed that roughening the surface of a stainless steel, which is an iron base alloy, would improve oxidation resistance since the documents cited relate to the processing of nickel-base alloys and titanium-base alloys none of these documents refer to stainless steels much less ferritic stainless steels.

Seventeenth, the Appellant primarily argues the prior art does not teach or suggest the distinctive aluminum-rich oxide scale and the significant improvement in high temperature oxidation resistance recited in the claims of the subject application; Dr. Brady has testified that these features were unexpected and surprising at the time of the invention claimed in the subject application; and because the results are not taught or suggested in the prior art, it must be the case that these results were unexpected from the prior art set forth by the Examiner.



In response, the Examiner notes that when a substantially similar prior art composition relative to an instant invention is processed in the same manner (electropolishing) as the instant invention, substantially similar results are expected. MPEP 2112.01 I. Additionally, the Examiner notes that line 7 of claim 1 recites 'so that when subjected to an oxidizing atmosphere at high temperature'; line 2 of claim 3-4 recite "when heated"; lines 2-3 of claim 9 recite "when heated in an oxidizing atmosphere"; lines 7-8 of claim 10 recites "so that the exposed electropolished surface develops an aluminum-rich oxide scale when heated in an oxidizing atmosphere"; line 4 of claim 13 recited "when heated in an oxidizing atmosphere"; and lines 3-4 of claim 26 recite "when subjected to a temperature and an atmosphere characteristic of operating conditions within a solid oxide fuel cell". Thus, the step of heating under oxidizing conditions at a high temperature to form the distinctive aluminum-rich oxide scale that would be unexpected as argued by the Appellant is not a positively recited required step in the instant method and thus the Examiner has treated this language as optional language in accordance with MPEP §2111.04.

#### **(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Art Unit: 1733

/Jessee Roe/

Examiner, Art Unit 1733

Conferees:

/Gregory L Mills/

Supervisory Patent Examiner, Art Unit 1700

/ Roy King/

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